4 Kitefin shark in the Northeast Atlantic (entire ICES Area)

4.1 Stock distribution

Kitefin shark *Dalatias licha* is distributed widely in the deeper waters of the northeast Atlantic, from Norway to northwest Africa and the Gulf of Guinea, including the Mediterranean Sea and NW Atlantic.

The stock identity of kitefin shark in the NE Atlantic is unknown. However, the species seems to be more abundant in the southern area of the Mid-Atlantic Ridge (Subarea 10). Elsewhere in the NE Atlantic, kitefin shark is recorded infrequently. The species is caught as bycatch in mixed deep-water fisheries in subareas 5–7, although at much lesser abundance than the main deep-water sharks (see Section 3), and the species composition of the landings is not accurately known.

For assessment purposes, the Azorean stock (Subarea 10) is considered as a management unit.

4.2 The fishery

4.2.1 History of the fishery

A detailed description of historical fisheries can be found in Heessen (2003) and ICES (2003). The Azorean target fishery stopped at the end of the 1990s. Elsewhere in the North Atlantic, it is a frequent bycatch in various deep-water fisheries.

Historically, Azorean landings of kitefin shark began in the early 1970s and increased rapidly to over 947 tonnes in 1981, fluctuating considerably thereafter, at least in part due to market fluctuations. Landings peaked at 937 tonnes in 1984 and 896 tonnes in 1991. In the 1990s, these landings have declined, possibly as a result of economic problems related to markets. From the early 1990s there has been some landings from other areas, which have declined from 2005 following the implementation and reduction over time of the TAC for deepsea sharks.

4.2.2 The fishery in 2020

Currently there are no target fisheries for kitefin shark. Landings in the northeast Atlantic have been at low levels since 2005, with most of the catches reported from subareas 7, 8 and 10 (Table 4.1 and Figure 4.1). Small reported landings may correspond to coding errors.

4.2.3 ICES advice applicable

ICES advised in 2019 that "*when the precautionary approach is applied, there should be zero catches in each of the years 2020–2023*".

This is similar to the 2006 advice where ICES advised: "*This stock is managed as part of the deep-sea shark fisheries. No targeted fisheries should be permitted unless there are reliable estimates of current exploitation rates and sufficient data to assess productivity. It is recommended that exploitation of this species should only be allowed when indicators and reference points for future harvest have been identified and a management strategy, including appropriate monitoring requirements has been decided upon and is implemented*".

4.2.4 Management applicable

The EU TACs that have been adopted for deep-sea sharks in European Community waters and international waters in different ICES subareas are summarized in the table below. The deep-sea shark category includes the kitefin shark *Dalatias licha* (Council regulation (EC) No 2285/2016).

Year	Subareas 5–9	Subarea 10	Subarea 12 (includes also *Deania histricosa* and *Deania profondorum*
2005 and 2006	6763	14	243
2007	2472(1)	20	99
2008	1646(1)	20	49
2009	824(1)	10(1)	25(1)
2010	0(2)	0(2)	0(2)
2011	0(3)	0(3)	0(3)
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	10(4)	10(4)	0
2018	10(4)	10(4)	0
2019	7(4)	7(4)	0
2020	7(4)	7(4)	0

(1) Bycatches only. No directed fisheries for deep-sea sharks are permitted.

(2) Bycatches of up to 10% of 2009 quotas are permitted.

(3) Bycatches of up to 3% of 2009 quotas are permitted.

(4) Bycatch only for bottom longline fisheries targeting black scabbardfish

Council Regulation (EC) No 1568/2005 banned the use of trawls and gillnets in waters deeper than 200 m in the Azores, Madeira and Canary Island areas.

Council Regulation (EC) No 41/2007 banned the use of gillnets by Community vessels at depths greater than 600 m in divisions 6.a-b, 7.b-c, 7.j-k and Subarea 12. A maximum bycatch of deep-water shark of 5% is allowed in hake and monkfish gillnet catches and 10% on the bottom long-line fisheries targeting black scabbardfish.

A gillnet ban in waters deeper than 200 m is also in operation in the NEAFC regulatory Area (all international waters of the ICES Area). NEAFC also ordered the removal of all such nets from these waters by 1 February 2006.

In 2009, the Azorean Regional Government introduced new technical measures for the demersal/deep-water fisheries (Portaria n.º 43/2009 de 27 de Maio de 2009) including area restrictions by vessel size and gear, and gear restrictions (hook size and maximum number of hooks on the longline gear). These measures have been adapted thereafter. In Azorean waters, there is a network of closed areas (summarized in Section 20). The Condor seamount has been closed to demersal/deep-water fisheries since 2010.

Since 2016, and in order to mitigate the potential damaging impacts of bottom trawling, fishing with bottom trawls was permitted only at, or above, a depth of 800 metres (EU Regulation 2016/2336).

A by-catch TAC for deep-water sharks was allowed for each of the years from 2017 to 2020, on a trial basis, in the directed artisanal deep-sea longline fisheries for black scabbardfish (Council regulation (EU) 2016/2285; Council regulation (EU) 2018/2025). According to this limited landing of unavoidable by-catches of deep-sea sharks were allowed and Member States should develop regional management measures for the black scabbardfish fishery and establish specific data-collection measures for deep-sea sharks to ensure their close monitoring. Specifically, 10 tonnes were allowed for deep-sea sharks in Union and international waters of ICES subareas 5, 6, 7, 8 and 9, in Union and international waters of ICES Subarea 10 and in Union waters of CECAF 34.1.1, 34.1.2 and 34.2. This allowance was in accordance with ICES indications according to which in the artisanal deep-sea longline fisheries for black scabbardfish, the restrictive catch limits lead to misreporting of unavoidable by-catches of deep-sea sharks, which are currently discarded dead.

The Council regulation (EU) 2016/2285 affects specifically the Portuguese deep-water longline fishery targeting black scabbardfish in ICES Division 9.a and Subarea 10. As a response, Portugal has proposed an action plan focusing the black scabbardfish fishery and this plan is coordinated by the Portuguese General Directorate of Fisheries. Among other objectives, under this plan different management strategies were expected to be evaluated.

The council regulation (EU) 2021/91 fixing, for the years 2021 and 2022, the fishing opportunities for Union fishing vessels for certain deep-sea fish stocks, prohibits to fish for deep-sea sharks in ICES subareas 5 to 9, in Union and international waters of ICES subarea 10, in international waters of ICES subarea 12 and in Union waters of CECAF areas 34.1.1, 34.1.2 and 34.2, and to retain on board, tranship, relocate or land deep-sea sharks caught in those areas, with no exceptions.

4.3 Catch data

4.3.1 Landings

The annual landings reported from each country are given in Table 4.1 and in Figure 4.1.

4.3.2 Discards

No new data were presented this year.

Discard rates of 15–85% of the kitefin shark caught per set were reported from the sampled Azorean longliners during 2004–2010 (ICES, 2012). Since 2011, discards may have increased due to management restrictions, or been landed as unspecified elasmobranchs.

Sporadic and low levels of kitefin shark discards were reported from the Spanish trawl fleets operating in divisions 8.c and 9.a in 2010–2012.

4.3.3 Quality of catch data

Historic landings of deep-water sharks taken in the Azores were commonly gutted, finned, beheaded and also skinned. Only the trunks and, in some cases, the livers were landed. Misidentification problems were likely to occur with other deep-water shark species in ICES Division 10.a.

The reported Azorean landings data come exclusively from the commercial first sale of fresh fish at auctions and so landings data (Table 4.1) may be underestimated.

4.4 Commercial catch composition

No new information.

4.5 Commercial catch–effort data

No new information.

4.6 Fishery-independent surveys

Existing research surveys rarely catch kitefin shark, as the surveys are not designed for the species, and thus will not provide relevant information for the assessment.

Relative abundances of kitefin shark (ind. h^{-1}) from the Scottish deep-water trawl survey (depth range 500–1000 m) were submitted in 2016 to the group (Table 4.2). These data confirm that only low numbers are caught (<10 specimens are caught each survey). For the entire survey period, a total of 34 specimens (8 males of 60–110 cm, and 26 females of 40–140 cm) have been caught.

Relative biomass estimates of kitefin shark (kg $haul^{-1}$) from the Spanish trawl survey on the Porcupine Bank were provided to WGEF (WD03 Fernández-Zapico *et al*., 2021). Few individuals were caught over the 18-year survey period (177 until 2014). In 2020, the biomass index of *D. licha* increased slightly and abundance decreased, though very little (Figure 4.2). However, the mean biomass of 2019–2020 remained low compared with the 2014–2018 values due to the peak in 2014 (Figure 4.3). Most specimens caught were 34 to 108 cm TL and were caught mainly in the deepest strata in the south, west and east of the study area (Figure 4.4–4.5).

Relative biomass estimates of kitefin shark (kg $haul^{-1}$) from the bottom trawl survey on the Northern Spanish Shelf were submitted this year to the group (Figure 4.6–4.8; WD04 Fernández-Zapico *et al*., 2021). The only caught individual sized 44 cm and was found at 577 m depth in the Central Cantabrian Sea (Figure 4.7–4.8).

The Azorean longline survey (ARQDACO(P)-Q1) has on average of 495 fishing stations per survey, covering a depth range 50–1200 m. During the period 1995–2018, a total of 102 kitefin sharks were caught, averaging about five individuals per year (Santos *et al*., 2020). Over the entire time period, specimens were caught at depths of 150–850 m and their total length ranged from 43–150 cm (Santos *et al*., 2020).

4.7 Life-history information

There is no new information available.

4.8 Exploratory assessment models

Exploratory kitefin shark stock assessments were conducted during the 1980s, using an equilibrium Fox production model (Silva, 1987). The stock was considered intensively exploited with the average observed total catches (809 t) near the estimated maximum sustainable yield (MSY = 933 t). An optimum fishing effort of 281 days fishing bottom nets and 359 trips fishing with handlines was proposed, corresponding approximately to the observed effort.

During the DELASS project (Heessen, 2003), a Bayesian stock assessment approach using the Pella-Tomlinson biomass dynamic model was applied to two fisheries, handline and bottom gill-net (ICES, 2003; 2005). Based on the probability of the Biomass 2001 be less than B_{MSY}, the stock was considered depleted.

4.9 Stock assessment

No new assessment was undertaken in 2021.

In the last assessment (2019), the ICES framework for category 6 was applied (ICES, 2012). For stocks without information on abundance or exploitation, ICES considers that a precautionary reduction of catches should be implemented unless there is ancillary information clearly indicating that the current level of exploitation is appropriate for the stock.

Landings have declined after the early 1990s, which is considered to be partly due to market conditions. In line with the zero TAC, landings have been negligible since 2010 and there are no new data to assess the status of the stock. In its most recent advice for 2020–2023, ICES advises that there should be no fisheries for this stock unless there is evidence that the fisheries will be sustainable..

4.10 Quality of assessments

No new assessment was undertaken.

4.11 Reference points

No reference points have been proposed for this stock.

4.12 Conservation considerations

Kitefin shark is listed as 'Vulnerable' on the IUCN Red List (Finucci *et al*., 2018)

4.13 Management considerations

Preliminary assessment results suggested that the stock might have been depleted to about 50% of virgin biomass. However, further analysis is required to better understand the actual status of the stock. Fisheries for kitefin shark have been affected by fluctuations in the price of shark liver oil. An analysis of liver oil prices may provide some information on historical exploitation levels of this species.

There are no adequate fishery-independent surveys to monitor the stock. WGEF recommends that the development of a fishery should not be permitted unless data on the level of sustainable catches become available. If an artisanal sentinel fishery is established, it should be accompanied by a data collection programme.

4.14 References

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Table 4.1. Kitefin shark in the Northeast Atlantic. Working Group estimates of landings (t) of kitefin shark *Dalatias licha*.

Country	Area	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Germany	7j	5.9																5.9
	7k	15.1																15.1
France	27						1.2											1.2
	5b		1.3															1.3
	7b						0.1											0.1
	7e											0.0			0.3			0.3
	7g						0.0											0.0
	8a		0.5			0.0					0.0		0.0		0.0			0.5
	8b	1.1	1.4	1.0	0.8	0.2	0.4	0.6	0.0	0.0	0.0		0.1	0.0	0.1	0.0		5.7
	8c		0.1	0.0				0.1										0.2
UK	6a	19.1	24.5	1.8														45.5
	7b	0.4		0.3														0.7
	7c	11.3	0.3															11.7
	7j	26.4	3.7	1.3														31.4
	7k	32.3		1.0														33.3
	8c		0.7															0.7
	8d		0.1	0.2														0.3
	8e		1.5															1.5
	9b		4.2															4.2
Ireland	7b	0.0	0.4															0.4
	7c	4.6	5.3															9.9
	7j	0.4	0.7															1.2
	7k	2.2	2.3															4.5
	10	0.4																0.4
Portugal	9a	3.2	6.5	2.5	1.1	1.1	0.1	0.2	0.4	0.0	0.0		0.1	0.1	0.1	0.0	0.0	15.4
	10a	14.3	9.6	6.5	9.6	6.3	1.9	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		49.3
Total		136.9	63.1	14.7	11.5	7.5	3.7	1.9	0.4	0.0	0.0	0.0	0.3	0.1	0.5	0.0	0.0	240.8

Table 4.2. Kitefin shark in the Northeast Atlantic. Relative abundance of kitefin shark (number per hour trawling) from Scottish deep-water survey (depth range 500–1000 m: Only one fish has been caught outside this core depth range) in ICES Subarea 6.

Year	Nº hauls	Nº positive hauls	Nº fish	Mean Nph
1998	17	2	2	0.05
2000	13	0	0	0.00
2002	16	2	4	0.13
2004	14	2	2	0.07
2005	13	1	4	0.15
2006	20	3	8	0.20
2007	15	2	7	0.23
2008	20	3	5	0.13
2009	27	1	1	0.06
2011	15	1	1	0.07
2012	18	0	0	0.00
2013	11	1	1	0.09

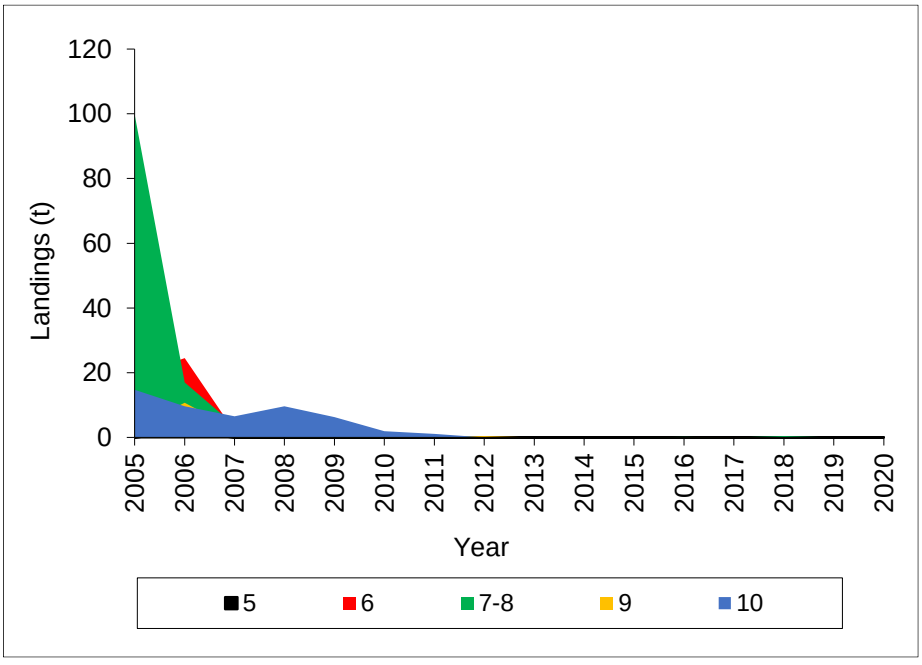

Figure 4.1. Kitefin shark in the Northeast Atlantic. Total landings of kitefin shark by ICES division.

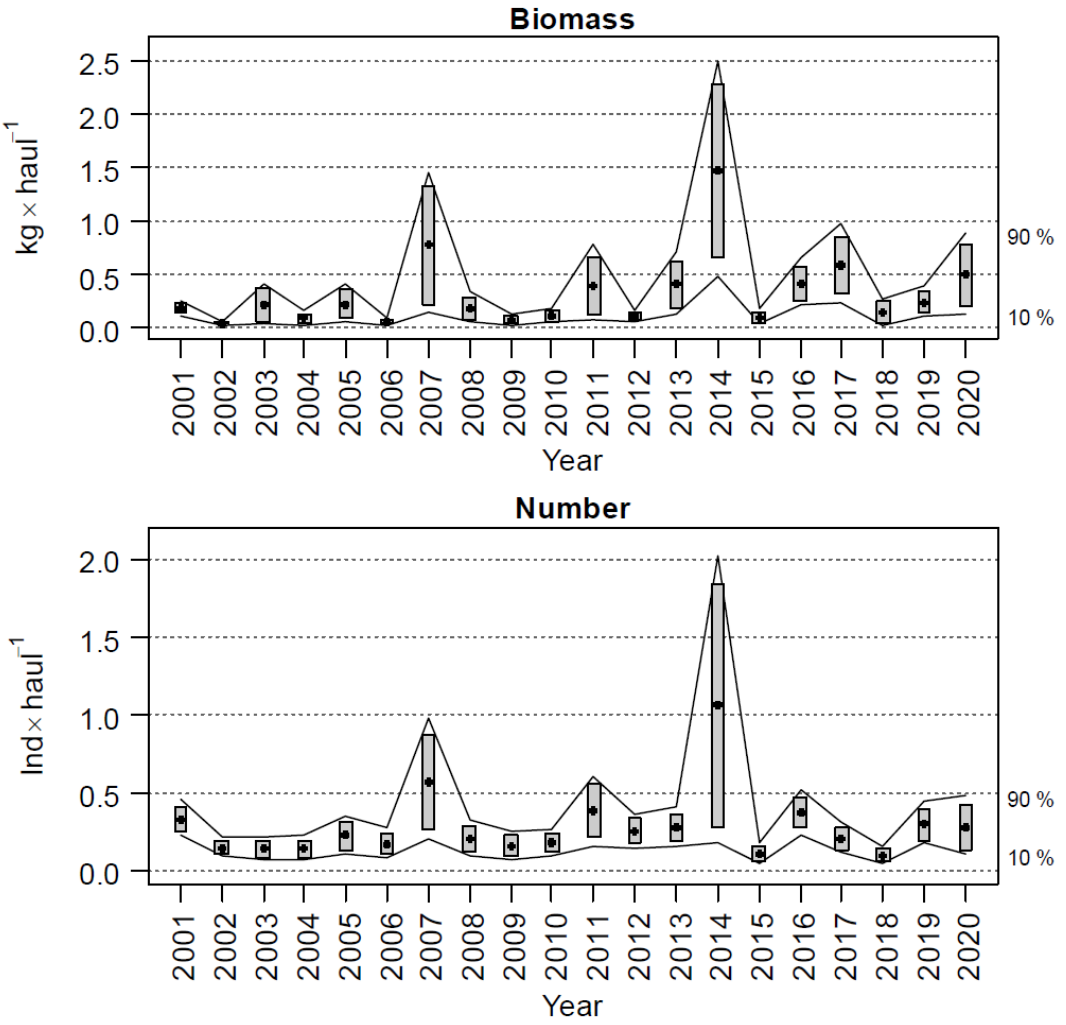

Figure 4.2. Kitefin shark in the Northeast Atlantic. Relative abundance of kitefin shark, in weight (kg/haul) and number from the Spanish groundfish survey on the Porcupine bank. Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (a = 0.80, bootstrap iterations = 1000). Source: Fernández-Zapico *et al.* (2021 WD03).

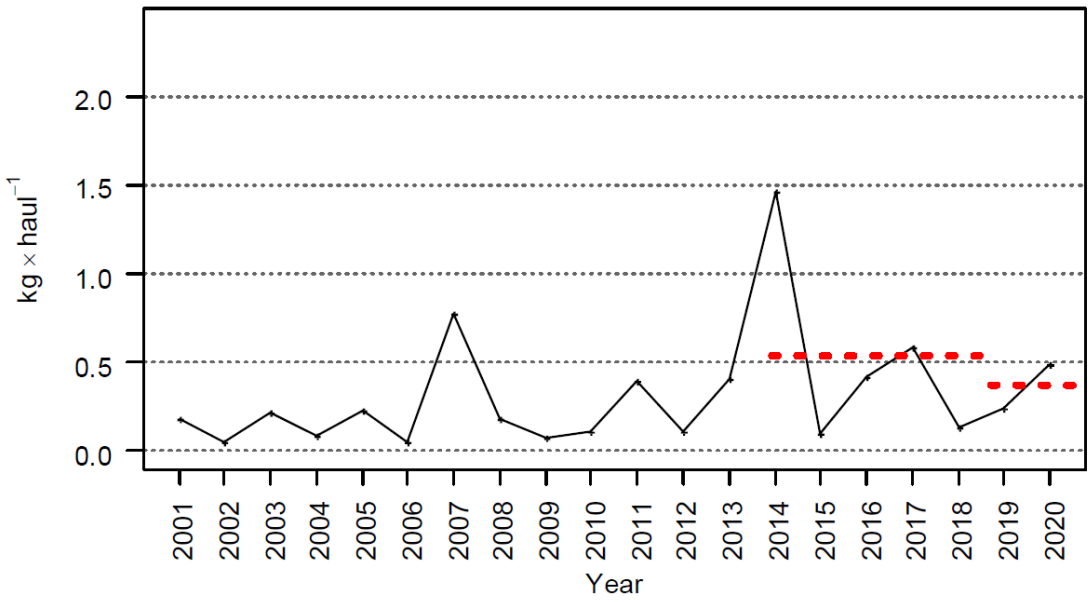

Figure 4.3. Evolution in kitefin shark biomass index in Porcupine surveys (2001–2020). Dotted red lines compare mean stratified biomass in the last two years (2019–2020) with the five previous years (2014–2018). Source: Fernández-Zapico *et al.* (2021 WD03).

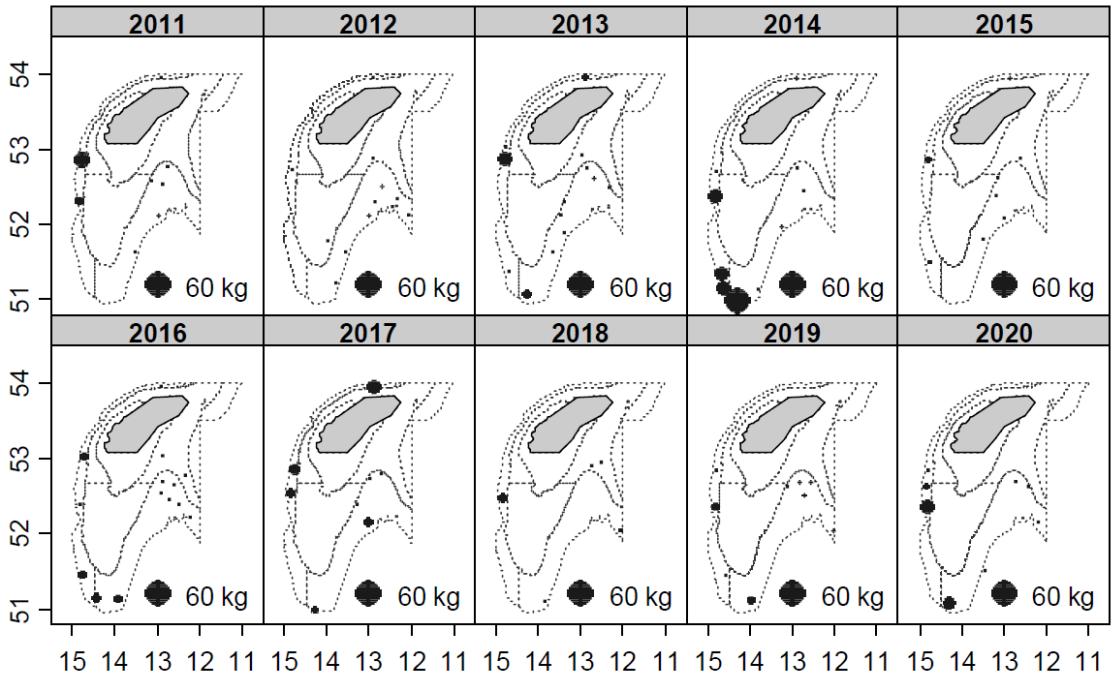

Figure 4.4. Kitefin shark in the Northeast Atlantic. Annual (2011–2020) spatial distribution of kitefin shark (kg/30 min haul) on the Porcupine bank survey. Source: Fernández-Zapico *et al.* (2021 WD03).

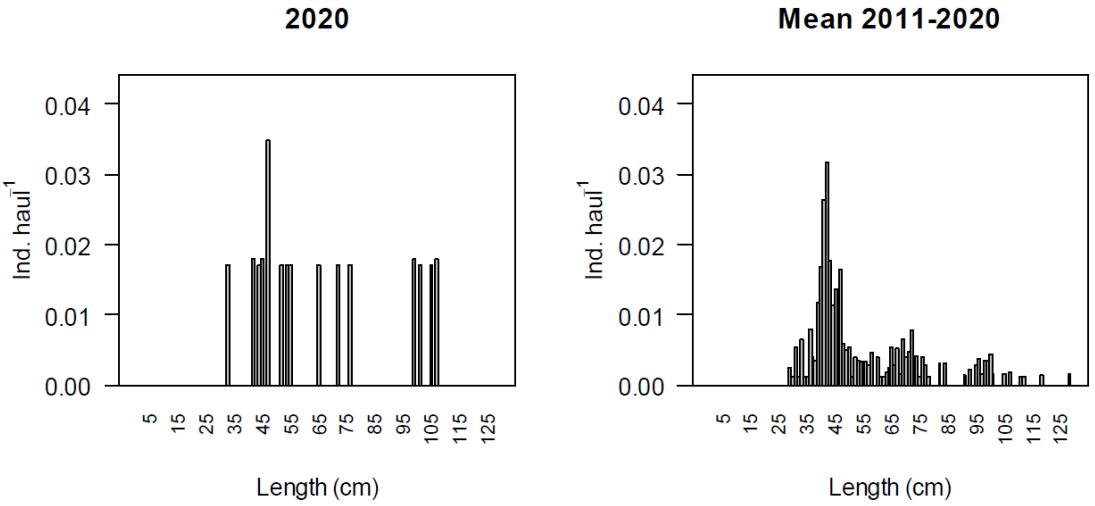

Figure 4.5. Kitefin shark in the Northeast Atlantic. Annual length composition of kitefin shark from the Spanish groundfish survey on the Porcupine Bank. Source: Fernández-Zapico *et al.* (2021 WD03).

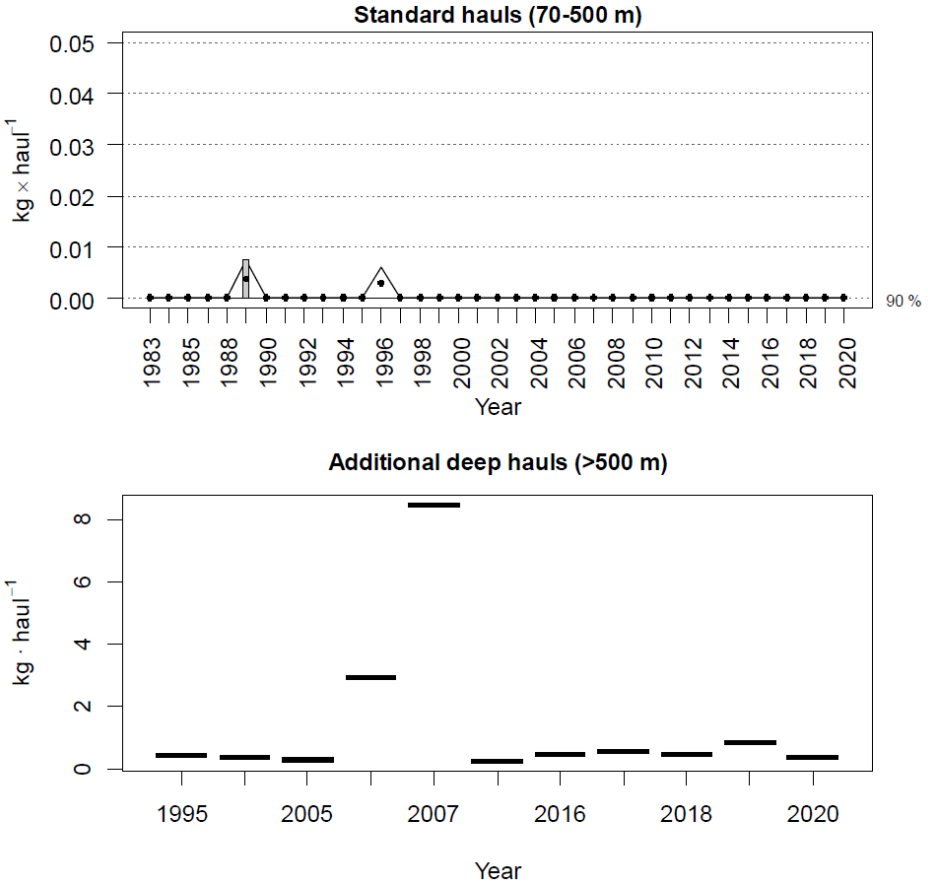

Figure 4.6. Kitefin shark in the Northern Spanish shelf. Relative abundance of kitefin shark in weight (kg/haul) from the Spanish bottom trawl survey in standard hauls (plot at the top) and in additional deep hauls (plot at the bottom). Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (a = 0.80, bootstrap iterations = 1000). Bottom figure boxplots of biomass considering only hauls with catches of *D. licha* in hauls out of the standard stratification (> 500 m) and not standardized to the area. Horizontal lines mark the median (and unique) value of the catch of the species in the year. Source: Fernández-Zapico *et al.* (2021 WD04).

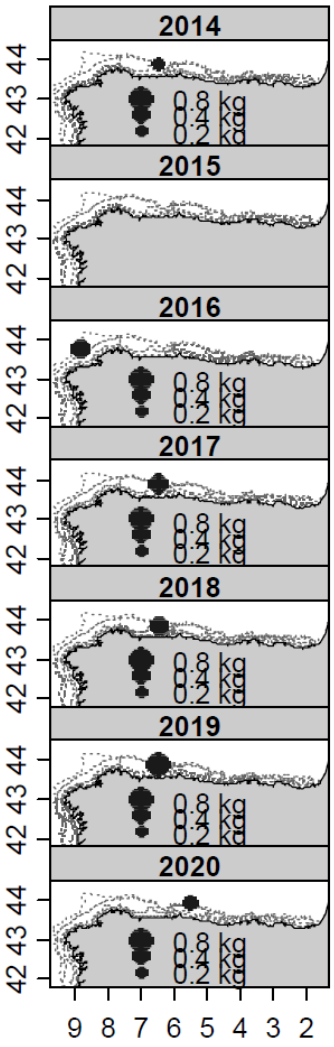

Figure 4.7. Kitefin shark in the Northern Spanish shelf. Annual (2014–2020) spatial distribution of kitefin shark (kg/30 min haul) from the Spanish bottom trawl survey. Source: Fernández-Zapico et al. (2021 WD04).

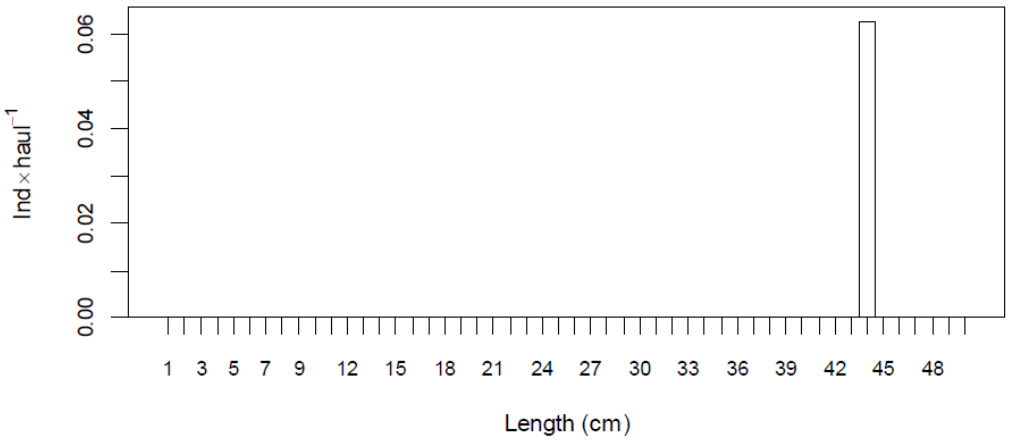

Figure 4.8. Kitefin shark in the Northern Spanish shelf. Annual length composition of kitefin shark from the Spanish bottom trawl survey in additional deep hauls (> 500 m) in 2020. Source: Fernández-Zapico *et al.* (2021 WD04).